June 27, 2019

Via ECFS
Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

Subject: *Further Clarification of Additional Information on Proposal for MOS Testing Framework (WC Docket No. 10-90)*

Dear Ms. Dortch:

In response to inquiries from Commission staff, this letter is to clarify certain points made in the information provided by Hughes Network Systems, LLC ("Hughes") on June 6, 2019.[1]

- CPE used in tests: Hughes clarifies that the customer equipment such as handsets (CPE) used in the testing should be the same as that is provided or available to the provider's actual broadband customers. Providers should use in their testing the same network adapters and/or handset equipment that are available to their residential customers commercially.

- Network and test conditions: Hughes clarifies that its statement in the Supplemental MOS Filing that "[t]he number of subjects and test conditions shall be configured to achieve a MOS of 4.0 with a 95% confidence interval of +/- 0.3" was intended to refer to the achievement of the confidence interval, and was not intended to suggest that changes would be made to the provider's operational network for purposes of the testing. Relevant network parameters such as voice codec, bit rate, bandwidth allocation and prioritization of VoIP traffic used in the testing will be the same as those used in the provider's commercial network. The laboratory subjective test serves to establish that the network as configured can achieve a mean opinion score ("MOS") of 4 or greater. Laboratory subjective testing will be carried out consistent with the guidelines in the ITU-T P.805 standard,[2] which includes the use of subjects in soundproof rooms to control for unpredictable factors such as outside noise. The ongoing monitoring of the service, based on call data records and conformance to the baseline, serves to ensure that the network has not deviated meaningfully in terms of the parameters that affect voice quality. In prior filings, Hughes has observed that the ITU's own E-Model algorithm and other literature raise questions about the capabilities

[1] Letter from Jennifer A. Manner, Hughes, to Marlene H. Dortch, FCC, WC Docket No. 10-90 (filed June 6, 2019) ("Supplemental MOS Filing").

[2] ITU-T Recommendation P.805 (2007), *Subjective Evaluation of Conversational Quality,* available at https.://www.itu.int/rec/T-REC-P.805/en ("*Subjective Evaluation Standard*").

of geostationary satellite networks to achieve a MOS of 4 or greater using a conversational test, particularly under the parameters set out in the *Metrics Order*.[3] With the prospective changes that Hughes is proposing, however, including the use of the "80/80" standard and the greater predictability resulting from test subjects in soundproof rooms, Hughes believes that a MOS score of 4.0, as measured objectively with real users in controlled testing environments, may be achieved using satellite broadband, with typical network characteristics delivered by our current-generation satellite technology.

- Records of voice quality-related network parameters: In the Supplemental MOS Filing, Hughes indicated that providers would "[r]ecord the voice quality related network parameters that were in effect during the subjective test."[4] As noted, these parameters are recorded in Call Data Records collected in the media gateway in XML format for each voice call.[5] VoIP media gateways typically provide Call Data Records for each call that collect mean values for a number of parameters over the duration of the VoIP call, including delay, jitter, and packet loss. That is, the values for each call recorded in the Call Data Records represent the mean value for each parameter (delay, jitter, and packet loss) across the duration of the call.[6] In the context of the subjective test, these per-call values would then be averaged across all test calls, regardless of the MOS score achieved in any particular test.

- In the Supplemental MOS Filing, Hughes used an example in which 92% of calls achieved acceptable results for latency, jitter, and packet loss.[7] Pursuant to the "80/80" standard Hughes advocates, however, only 80% of calls would be required to meet these parametric standards in order to be deemed compliant.

Please direct any questions regarding this filing to the undersigned.

Sincerely,

/s/
Jennifer A. Manner
Senior Vice President, Regulatory Affairs

cc: Suzanne Yelen
Alexander Minard
Cathy Zima
Stephen Wang
Alec MacDonell

[3] *See, e.g.*, Reply of Hughes Network Systems, LLC to Oppositions and Comments on Petitions for Reconsideration, WC Docket No. 10-90 (filed Nov. 19, 2018) at 2, 6-7.

[4] Supplemental MOS Filing at 2. Hughes noted that these include voice codec and operational bit rate, latency, packet loss, and jitter. *Id.*

[5] *Id.*

[6] Some media gateways use the parameters recorded from the call to estimate a MOS score, which is also reported in the Call Data Record. Because these calculations will not be consistent with the Commission's Rules, Hughes proposes that any such MOS estimations in Call Data Records be disregarded.

[7] *Id.* at 4.